Contents

number 1

		page
Articles	*G J Rees:* Medium vacuum centrifugal molecular distillation in the isolation of high-boiling and heat-sensitive compounds—I. Siloxanes	5
	R Hackam and S K Salman: Novel design for accurate alignment of high voltage electrodes assembly	9
	C G Crockett: A glow discharge ion gun for etching	11
	A Barosi and T A Giorgi: A non-evaporable getter for low temperatures	15
Letter to the Editor	*A E Guttensohn, Jr, R E Govednik and R F Janninck:* Improved dc sputtering rates for reedblade contact deposition	21
Vacuum News		23
Classified abstracts	Editor's note	29
	Classification system	30
	Classified abstracts	31
Notes for contributors		39

number 2

		page
Articles	*M D Malev:* Gas absorption and outgassing of metals	43
	M Nagasaka, E Uyeda and T Yamashina: Sorption kinetics of oxygen at very low pressures by zirconium	51
	T Kanaji, K Asano and S Nagata: Behaviour of impurity atoms and adsorbed oxygen atoms on (001) face of iron epitaxial film	55
Letter to the Editor	*A Berman:* An improved technique for cleaning McLeod gauges	61
Notes for contributors		62
Vacuum news		63
Classified abstracts		69

number 3

		page
Articles	*R S Nelson:* Metallurgical applications of ion implantation and ion bombardment	79
	G Carter, D G Armour and L de Chernatony: Diffusive outgassing of solids during tempering	85
	H J R Perdijk: Thermochemical equilibria of residual gases in vacuum devices—III. The gases in operating valves	89
	M J Godden: Operating parameters of a hollow-cathode-discharge melting furnace	97
Vacuum news		101
Classified abstracts		111
Notes for contributors		120

VOL. 23 1973

number 4

		page
Articles	*P T Stroud, Helen M Lindsay and J G Perkins:* Some preliminary studies of the structure of ion bombarded thin films	125
	K F Poulter: The extension of the calibration of a mass spectrometer into the ultrahigh vacuum region	131
	H C W Beijerinck and N F Verster: A uniform temperature 400°C oven for UHV bake-out	133
	B J Hopkins and M Ibrahim: Oxygen adsorption on the (110) face of tantalum, niobium, molybdenum and tungsten single crystals	135
Letter to the Editor	*L Holland and L Laurenson:* The use of perfluoropolyether as a lubricant in vacuum systems	139
Conference report	*Libor Pátý:* 5th Czechoslovak Conference on Electronics and Vacuum Physics	141
Classified abstracts		143
Notes for contributors		156

number 5

		page
Articles	*W Eckstein and H Verbeek:* Bombardon: an apparatus for investigating the influence of 5–20 keV ions on metal targets	159
	R Bouwman, L H Toneman and A A Holscher: Quantitative study of the surface composition of binary alloys by Auger spectroscopy	163
	W Steckelmacher: On the theory of viscosity vacuum gauges	165
Biography	*E A Marland:* A biography of Herbert McLeod	171
Letters to the Editor	*J L Vossen:* Comments on "The influence of sputtering and transport mechanisms on target etching and thin film growth in rf systems"	175
	L Holland: The effects of temperature on sputtering yield and rf etching with photoresists	175
	H Galron: Reduction in outgassing rate of water vapour from a vacuum system after exposure, by improved heat treatment	177
	A M Bradshaw and P Seidel: A simple UHV throttle valve	179
Book reviews		181
Vacuum news		183
Notes for contributors		192

number 6

		page
Article	*C J Todd:* Electron spectroscopy from solid surfaces in UHV: a discussion of current progress with techniques involving electron (AES) photon (ESCA) and field stimulated electron emission	195
Letter to the Editor	*M R Nandagopal and H V Gopalakrishna:* Long duration surge voltage breakdown at low pressure	205
Conference report	*G L Saksagansky:* The Third All-Union Conference on High-Vacuum Physics and Technology	207
Erratum		211
Notes for contributors		212
Vacuum news		213

VOL
23
197

number 7

		page
Articles	*A W Jones, E Jones and E M Williams:* Investigation by techniques of electron stimulated desorption of the merits of glow discharge cleaning of the surfaces of vacuum chambers at the CERN intersecting storage rings	227
	R N Bloomer: Leaks	231
	R N Bloomer: Leak detection and measurements by vacuum bubblers	239
Education: The theory and practise of vacuum science and technology in schools and colleges	*B S Ramprasad and T S Radha:* On some design aspects of rotary vane pumps	245
Short communication	*M R Piggott:* Simple integral high vacuum valve system	251
Letter to the Editor	*J K N Sharma and V Prakash:* A laboratory UHV system	253
Vacuum news		255

number 8

		page
Articles	*M Pessa and T Valkonen:* Versatile sample holder for a study of high vapour pressure liquids by the X-ray fluorescence method	267
	A M Ghander and R K Fitch: A double beam ion source	269
	K M Welch: The pressure profile in a long outgassing vacuum tube	271
	Z Češpiro: The measurement accuracy of the Moser and Poltz McLeod gauge	277
Vacuum news		285
Classified abstracts		297

VOL. 23 1973

number 9

		page
Articles	*W Steckelmacher:* The high pressure sensitivity extension of thermal conductivity gauges	307
	S O Colgate and C B Smith: On the calculation of effective path lengths through beam scattering chambers	313
	R D Heap: Evacuating to 0.5–10 torr through long tubes	317
	B W L M Sessink and N F Verster: Design of elastomer O-ring vacuum seals	319
	B A Unvala and M Censlive: A large area substrate heater for ultra high vacuum	327
Short communication	*R Abjean, M Leriche and A Johannin-Gilles:* Quartz-crystal microbalance detection of mercury atomic beams for optical absorption studies	331
Letter to the Editor	*P Sadler:* Further development of the planetary piston pump	333
Classified abstracts		335

number 10

		page
Articles	*G Burrows:* Notes on some features of high-vacuum distillation	353
	M D Malev: Gas sorption by barium films	359
	V Ramesh and D J Marsden: Direct simultaneous measurement of rotational and translational accommodation coefficients	365
Vacuum news		371
Classified abstracts		381

number 11

		page
Articles	*J McK Nobbs:* Mass spectrometric determination of oxygen at partial pressures of less than 1.5 μPa (10^{-8}) torr	391
	C B Lucas: The production of intense atomic beams	395
	M D Malev and E M Trachtenberg: Built-in getter-ion pumps	403
	T J Patrick: Outgassing and the choice of materials for space instrumentation	411
	R Berland et A Dussauchoy: Aspects statistiques des régimes de microdécharges électriques entre electrodes métalliques placées dans un vide industriel	415
Short communication	*K Pearmain, B A Unvala and B H Barter:* A laboratory technique for electron beam brazing	423
Book review		425
Classified abstracts		426
Notes for contributors		432

number 12

		page
Articles	*M Waldschmidt:* Die Krypton-85-Methode zur Ermittlung von Leckleitwerten	435
	I Berceanu and V K Ignatovich: Molecular flow of ultracold neutrons through long tubes	441
	H Boroffka and H Runge: Method for fast-switching the ion beam in an ion-implantation facility	447
Short communication	*K Nishimori, H Tokutaka, N Ishihara and H Takahara:* A new baking circuit for ultra high vacuum experiments	451
Conference report	*M Chvojka:* Report on the 11th International Conference on Phenomena in Ionized Gases, Prague, 1973	453
Book reviews		454
Vacuum news		455
Classified abstracts		463

VOL.
23
1973

Author index of articles

The figures refer to page numbers

Abjean, R, 331
Armour, D G, 85
Asano, K, 55

Barosi, A, 15
Barter, B H, 423
Beijerinck, H C W, 133
Berceanu, I, 441
Berland, A, 415
Berman, A, 61
Bloomer, R N, 231, 239
Boroffka, H, 447
Bouwmann, R, 163
Bradshaw, A M, 179
Burrows, G, 353

Carter, G, 85
Censlive, H, 327
Češpiro, Z, 277
Chernatony, L de, 85
Chvojka, M, 453
Colgate, S O, 313
Crockett, C G, 11

Dussauchoy, A, 415

Eckstein, W, 159

Fitch, R K, 269

Galron, H, 177
Ghander, A M, 269
Giorgi, T A, 15
Godden, M J, 97
Gopalakrishna, H V, 205
Govednik, R E, 21
Guttensohn, Jr, A E, 21

Hackam, R, 9
Heap, R D, 317
Holland, L, 139, 175
Holscher, A A, 163
Hopkins, B J, 135

Ibrahim, M, 135
Ignatovich, V K, 441
Ishihara, N, 451

Janninck, R F, 21
Johannin-Gilles, A, 331
Jones, A W, 227
Jones, E, 227

Kanaji, T, 55

Laurenson, L, 139
Leriche, M, 331
Lindsay, H M, 125
Lucas, C B, 395

Malev, M D, 43, 359, 403
Marland, E A, 171
Marsden, D J, 395

Nagasaka, M, 51
Nagata, S, 55
Nandagopal, M R, 205
Nelson, R S, 79
Nishimori, K, 451
Nobbs, J McK, 391

Patrick, T J, 411
Pátý, L, 141
Pearmain, A, 423
Perdijk, H J R, 89
Perkins, J G, 125
Pessa, M, 267
Piggot, M R, 251
Poulter, K F, 131
Prakash, V, 253

Radha, T S, 245
Ramesh, V, 365
Ramprasad, B S, 245
Rees, G J, 5
Runge, H, 447

Sadler, P, 333
Saksagansky, G L, 207
Salman, S K, 9
Seidel, P, 179
Sessink, B W L M, 319
Sharma, J K N, 253
Smith, C B, 313
Steckelmacher, W, 165, 307
Stroud, P T, 125

Takahara, H, 451
Todd, C J, 195
Tokutaka, H, 451
Toneman, L H, 163
Trachtenberg, E M, 403

Unvala, B A, 327, 423
Uyeda, E, 51

Valkomen, T, 267
Verbeeck, H, 159
Verster, N F, 133, 319
Vossen, J L, 175

Waldschmidt, M, 435
Welsh, K M, 271

Yamashina, T, 51

OL.
23
973

Printed in Great Britain by The Whitefriars Press Ltd., London and Tonbridge

Subject index of articles

The figures refer to page numbers

Accommodation coefficients, simultaneous measurement of rotational and translational, 365
Adsorption,
adsorbed oxygen and impurity atoms on iron epitaxial film, 55
adsorption of oxygen on tantalum, niobium, molybdenum and tungsten single crystals, 135
Atomic beams, production of intense, 395
Auger spectroscopy, study of surface composition of binary alloys, 163

Bake-out for ultrahigh vacuum, a new control circuit, 451
Beam-scattering chambers, calculation of effective path lengths through, 313
Breakdown in vacuum, 205

Conferences and symposia, 141, 207, 453

Distillation under high vacuum, 353

Electrical microdischarges between electrodes (in French), 415
Electron beam brazing, 423
Electron spectroscopy, from solid surfaces in uhv, a review, 195
Evacuating, through long tubes, 317

Gas absorption, of metals, 43
Getter, an non-evaporable type for low temperatures, 15
Getter-ion pumps, built-in, 403

High-voltage electrodes, in ultrahigh vacuum, 9

Ion gun, for etching, 11
Ion implantation and ion bombardment,
metallurgical applications of, 79
Ion implantation, method for fast-switching the ion beam, 447
Ions on metal targets, 'Bombardon' apparatus, 159
Ion source, a double beam type, 269

Leakage values, determination by the krypton 85 method (in German), 435
Leak detection and measurement, by vacuum bubblers, 239
Leaks, a review, 231

Mass spectrometer, calibration in ultrahigh vacuum region, 131
Mass spectrometric determination, of oxygen at partial pressures below 1.5 μPa, 391
McLeod gauge of Moser and Poltz type, measurement accuracy of, 277
McLeod gauges, cleaning of, 61
McLeod, H, a short biography, 171
Melting furnace, hollow-cathode-discharge type, 97
Microbalance, quartz-crystal for detection of mercury atomic beams, 331
Molecular distillation: Siloxanes, 5
Molecular flow, of ultra-cold neutrons through long tubes, 441

O-ring vacuum seals, design of, 319
Outgassing, long vacuum tube, pressure profile in, 271
materials for space instrumentation, 411
of metals, 43
of solids during tempering, 85
of water vapour from a vacuum system, 177
Oven, for bake-out at 400°C, 133

Perfluoropolyether, as a lubricant in vacuum systems, 139
Piston pump, of the planetary type, 333

Residual gases, in operating valves, 89
Rotary vane pumps,
some design aspects, 245

Sorption kinetics, of oxygen by zirconium, 51
Sorption of gas, by barium films, 359
Sputtering and transport mechanisms, influence on target etching and thin film growth in rf systems, 175
Sputtering, improved rates for reedblade contact deposition, 21
Substrate heater, for ultrahigh vacuum, 327

Thermal conductivity gauges,
high pressure sensitivity of, 307
Thin films,
Applications of, review of *Proceedings of the 1972 International Conference,* 425
physics of, review of bibliography by H Mayer, 181
structure of ion bombarded, 125

Ultrahigh vacuum system, 253

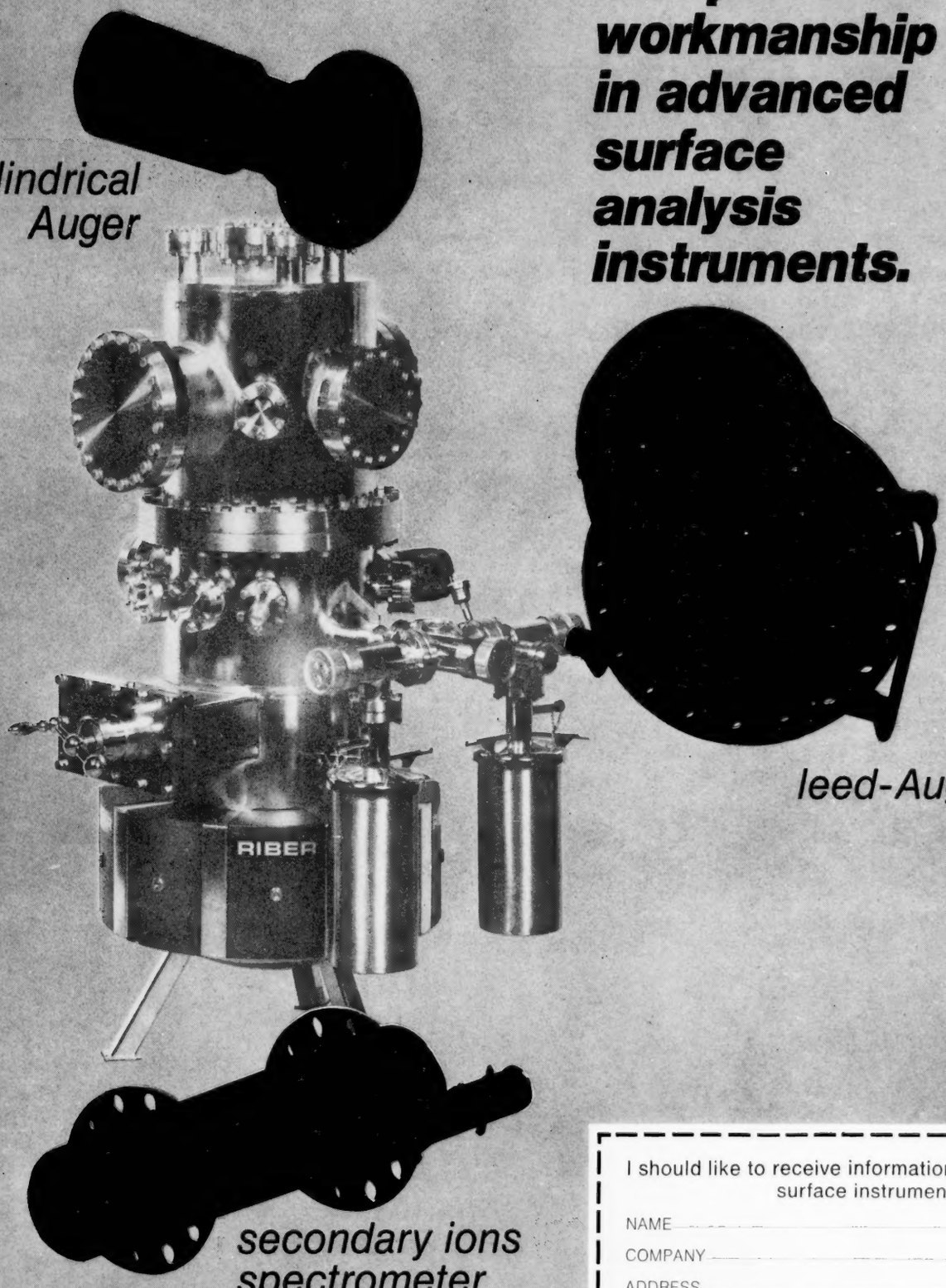
Vacuum chambers, investigation of merits of glow discharge cleaning of surfaces of, 227
Vacuum gauges, theory of viscosity type, 165
Vacuum microbalance techniques, review of book edited by Gast and Robens, 182
Vacuum valve, a simple uhv throttle type, 179
Vacuum valve system, a simple integral 251
Vapour pressure, sample holder for study of high vapour pressure liquids by the X-ray fluorescence method, 267

VOL
23
197

SOCIÉTÉ FRANÇAISE
D'ULTRA-VIDE

RIBER

European workmanship in advanced surface analysis instruments.



cylindrical Auger

leed-Auger

secondary ions spectrometer

SOCIÉTÉ FRANÇAISE D'ULTRA-VIDE **RIBER**

RIBER S.A. B.P. 65_92503 Rueil-Malmaison France

I should like to receive information on the **RIBER** surface instruments

NAME

COMPANY

ADDRESS

RIBER

largest European manufacturer of ion pumping equipment

VOL.
23
1973

The Finest Quadrupole Mass Spectrometer Ever Made—is Being Made by UTi

and our competitors know it, many of them recommend it, some even buy it!

SENSITIVITY: 1×10^{-3} Amps/Torr with Faraday cup, 300 Amp/Torr with electron multiplier (sensitivity attained with an emission current of $\approx$ 2 ma). Minimum detectable partial pressure: 1×10^{-14} Torr (N_2). Minimum detectable concentration: 100 parts per billion.

STABILITY: Source potentials regulated to $\pm 0.1\%$ /8 hrs. Emission current is feedback-loop regulated to $\pm 0.1\%$ / 8 hrs. and is space charge operated. Electron multiplier high voltage ripple $< 0.02\%$.

REPRODUCIBILITY: Peak height will reproduce to within $\pm 1\%$ over an 8 hour period. Peak height ratios can be reproducibly measured over an 8 hour period with a precision of $\pm 0.5\%$.

MULTICHANNEL PROGRAMMING: Four variable, independent, switch selected mass scan programs may be stored. Additionally, mass spectra may be remotely programmed, in a digital or analog fashion.

DIGITAL DISPLAY: Mass number, sweep width, electron emission current, total pressure and ion current are presented on LED digital indicators.

COMPUTER COMPATIBILITY: A/D conversion and BCD encoding of signal output. Input from computer can: scan any portion, or all, of the 1–300 AMU mass range; select "TOTAL" or "PARTIAL PRESSURE" mode of operation; select either FARADAY cup or Electron Multiplier detector; and range the picoammeter through all 8 decades.

GENERAL ☐ Off axis electron multiplier ☐ Separate, stainless steel, non-multiplying, FARADAY cup ☐ TOTAL Pressure readout, calibrated in TORR ☐ Dual filaments with automatic switchover ☐ Automatic protection against vacuum loss ☐ Self-tuning RF/DC generator ☐ Self-zeroing 8 decade picoammeter ☐ Molybdenum rods are double sized (1.27 cm diam.) ☐ Entrance aperture and r_o are ≈ 0.5 cm. ☐ Performance (except multiplier gain) is singularly immune to contamination ☐ Scan speed: Variable 75 ms to 10 min/mass range; Fixed 2 min and 10 min/range (250 μsec to 10 min per AMU).

UTi *UTHE TECHNOLOGY INTERNATIONAL*
320 Soquel Way, Sunnyvale, California 94086
(408) 738-3301

VOL 23 197